

Application No.: 10/820,024
Amendment under 37 CFR 1.111
Reply to Office Action dated May 12, 2006
August 14, 2006

AMENDMENTS TO THE CLAIMS

Please substitute the following claims for the pending claims with the same numbers respectively:

Claims 1-2 (Cancelled):

Claim 3 (Currently amended): A method for making a conductive electroless plating powder comprising the steps of:

(I) allowing [[the]] core particles which have a noble metal ion-capturing ability to capture noble metal ions, and reducing the noble metal ions so that the surfaces of the core particles support the noble metal;

(II) dispersing the core particles in an initial thin film-forming solution containing nickel ions, a reducing agent, and a complexing agent comprising an amine to prepare an aqueous suspension, and reducing the nickel ions to form initial thin nickel films on a surface of each of the core particles; and

(III) adding a nickel ion-containing solution containing the [[same]] complexing agent and a reducing agent-containing solution individually and simultaneously to the aqueous suspension containing the core particles provided with the

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initial thin nickel films and the complexing agent to perform electroless plating;

adjusting the amounts of the nickel ion-containing solution added and the reducing agent-containing solution added;

adjusting the initial concentration of the complexing agent in the aqueous suspension; and

adjusting the concentration of the complexing agent in the nickel ion-containing solution, so as to maintain the concentration of the complexing agent in the aqueous suspension in the range of 0.003 to 10 moles/l in said step of (III) adding a nickel ion-containing solution containing the same complexing agent and a reducing agent-containing solution.

Claim 4 (Cancelled):

Claim 5 (Currently amended): [[A]] The method according to claim 3, further comprising the step of using glycine or ethylenediamine as the complexing agent.

Claim 6 (Currently amended): [[A]] The method according to claim [[4]] 3, further comprising the step of using glycine or ethylenediamine as the complexing agent.

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Claim 7 (Currently amended): [[A]] The method according to claim 3, further comprising the step of providing, before said step (III), a ratio of the sum of the surface areas of the core particles contained in the aqueous suspension to the volume of the aqueous suspension between 0.1 to 15 m²/l.

Claim 8 (Cancelled):

Claim 9 (Currently amended): [[A]] The method according to claim 5, further comprising the step of providing, before said step (III), a ratio of the sum of the surface areas of the core particles contained in the aqueous suspension to the volume of the aqueous suspension between 0.1 to 15 m²/l.

Claim 10 (Currently amended): [[A]] The method according to claim 3, further comprising the step of imparting the noble metal ion-capturing ability to the core particles by a surface treatment.

Please add the following new claims 11-33 as follows:

Claim 11 (New): The method according to claim 10, wherein said step of imparting the noble metal ion-capturing ability to

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the core particles by a surface treatment includes adjusting the amount of the surface treatment in the range between 0.3 and 100 mg/m² of the surface area of the core particles.

Claim 12 (New): The method according to claim 3, wherein said step of (II) dispersing the core particles in an initial thin film-forming solution containing nickel ions, a reducing agent, and a complexing agent includes using glycine or ethylenediamine for the complexing agent; and

wherein said step of (III) adding a nickel ion-containing solution containing the complexing agent and a reducing agent-containing solution includes using glycine or ethylenediamine for the complexing agent.

Claim 13 (New): The method according to claim 3, wherein said step of adjusting the initial concentration of the complexing agent includes using glycine or ethylenediamine.

Claim 14 (New): The method according to claim 3, further comprising the step of providing, before said step of (III) adding a nickel ion-containing solution containing the complexing agent and a reducing agent-containing solution, a ratio of the sum of the surface areas of the core particles contained in the

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aqueous suspension to the volume of the aqueous suspension
between 0.1 to 15 m²/l.

Claim 15 (New): The method according to claim 12, further
comprising the step of providing, before said step of (III)
adding a nickel ion-containing solution containing the complexing
agent and a reducing agent-containing solution, a ratio of the
sum of the surface areas of the core particles contained in the
aqueous suspension to the volume of the aqueous suspension
between 0.1 to 15 m²/l.

Claim 16 (New): A method for making a conductive
electroless plating powder including columnar structures
extending in a direction of a thickness of a nickel film
comprising the steps of:

allowing the core particles which have a noble metal ion-
capturing ability to capture noble metal ions, and reducing the
noble metal ions so that the surfaces of the core particles
support the noble metal;

dispersing the core particles in an initial thin film-
forming solution containing nickel ions, a reducing agent, and a
complexing agent comprising an amine to prepare an aqueous

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suspension, and reducing the nickel ions to form initial thin nickel films on a surface of each of the core particles;

providing a ratio of the sum of the surface areas of the core particles contained in the aqueous suspension to the volume of the aqueous suspension between 0.1 to 15 m²/l;

adding a nickel ion-containing solution containing the same complexing agent and a reducing agent-containing solution individually and simultaneously to the aqueous suspension containing the core particles provided with the initial thin nickel films and the complexing agent to perform electroless plating;

adjusting the amounts of the nickel ion-containing solution added and the reducing agent-containing solution added;

adjusting the initial concentration of the complexing agent in the aqueous suspension;

adjusting the concentration of the complexing agent in the nickel ion-containing solution, so as to maintain the concentration of the complexing agent in the aqueous suspension in the range of 0.003 to 10 moles/l in said step of adding a nickel ion-containing solution containing the same complexing agent and a reducing agent-containing solution.

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Claim 17 (New): The method according to claim 16, wherein said step of allowing core particles includes dispersing the core particles in a weakly acidic aqueous solution of a noble metal salt which is palladium chloride so that the noble metal ions are captured by the surfaces of the core particles.

Claim 18 (New): The method according to claim 16, wherein said step of dispersing the core particles in an initial thin film-forming solution containing nickel ions includes forming an initial thin film in the range of the thickness between 0.001 and 2 μm .

Claim 19 (New): The method according to claim 18, wherein said step of dispersing the core particles in an initial thin film-forming solution containing nickel ions includes forming an initial thin film in the range of the thickness between 0.005 and 1 μm .

Claim 20 (New): The method according to claim 16, wherein said step of dispersing the core particles in an initial thin film-forming solution containing nickel ions includes adjusting the concentration of the nickel ions in the initial thin film-forming solution in the range between 2.0×10^{-4} and 1.0 mol/l.

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Claim 21 (New): The method according to claim 20, wherein said step of dispersing the core particles in an initial thin film-forming solution containing nickel ions includes adjusting the concentration of the nickel ions in the initial thin film-forming solution in the range between 1.0×10^{-3} and 0.1 mol/l.

Claim 22 (New): The method according to claim 16, wherein said step of dispersing the core particles in an initial thin film-forming solution containing nickel ions includes adjusting the reducing agent in the initial thin film-forming solution in the range between 4×10^{-4} and 2.0 mol/l.

Claim 23 (New): The method according to claim 22, wherein said step of dispersing the core particles in an initial thin film-forming solution containing nickel ions includes adjusting the reducing agent in the initial thin film-forming solution in the range between 2.0×10^{-3} and 0.2 mol/l.

Claim 24 (New): The method according to claim 16, wherein said step of dispersing the core particles in an initial thin film-forming solution containing nickel ions, a reducing agent,

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and a complexing agent includes using sodium borohydride or dimethylamine borane for the reducing agent.

Claim 25 (New): The method according to claim 16, wherein said step of dispersing the core particles in an initial thin film-forming solution containing a complexing agent includes using glycine for the complexing agent; and

wherein said step of adding a nickel ion-containing solution containing the complexing agent includes using glycine for the complexing agent.

Claim 26 (New): The method according to claim 16, wherein said step of adjusting the initial concentration of the complexing agent includes using glycine.

Claim 27 (New): The method according to claim 16, wherein said step of adding a nickel ion-containing solution containing the complexing agent and a reducing agent-containing solution includes adjusting the concentration of the nickel ions in the nickel ion-containing solution in the range between 0.1 and 1.2 mol/l.

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Claim 28 (New): The method according to claim 27, wherein said step of adding a nickel ion-containing solution containing the complexing agent and a reducing agent-containing solution includes adjusting the concentration of the nickel ions in the nickel ion-containing solution in the range between 0.5 and 1.0 mol/l.

Claim 29 (New): The method according to claim 16, wherein said step of adding a nickel ion-containing solution containing the complexing agent and a reducing agent-containing solution includes adjusting the concentration of the reducing agent in the nickel ion-containing solution in the range between 0.1 and 20 mol/l.

Claim 30 (New): The method according to claim 29, wherein said step of adding a nickel ion-containing solution containing the complexing agent and a reducing agent-containing solution includes adjusting the concentration of the reducing agent in the nickel ion-containing solution in the range between 1 and 10 mol/l.

Claim 31 (New): The method according to claim 16, wherein said step of adding a nickel ion-containing solution containing

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the complexing agent and a reducing agent-containing solution includes adjusting the deposition rate of nickel between 1 and 10,000 nanometers/hour.

Claim 32 (New): The method according to claim 31, wherein said step of adding a nickel ion-containing solution containing the complexing agent and a reducing agent-containing solution includes adjusting the deposition rate of nickel between 5 and 300 nanometers/hour.

Claim 33 (New): A method for making a conductive electroless plating powder comprising the steps of:

(I) allowing the core particles which have a noble metal ion-capturing ability to capture noble metal ions, and reducing the noble metal ions so that the surfaces of the core particles support the noble metal;

(II) dispersing the core particles in an initial thin film-forming solution containing nickel ions, a reducing agent, and a complexing agent comprising an amine to prepare an aqueous suspension, and reducing the nickel ions to form initial thin nickel films on a surface of each of the core particles;

(III) adding a nickel ion-containing solution containing the same complexing agent and a reducing agent-containing solution

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individually and simultaneously to the aqueous suspension containing the core particles provided with the initial thin nickel films and the complexing agent to perform electroless plating; and

(IV) forming a gold plating layer as a top layer on the nickel film.

Claim 34 (New): A method for making a conductive electroless plating powder including columnar structures extending in a direction of a thickness of a nickel film comprising the steps of:

allowing the core particles which have a noble metal ion-capturing ability to capture noble metal ions, and reducing the noble metal ions so that the surfaces of the core particles support the noble metal;

dispersing the core particles in an initial thin film-forming solution containing nickel ions, a reducing agent, and a complexing agent comprising an amine to prepare an aqueous suspension, and reducing the nickel ions to form initial thin nickel films on a surface of each of the core particles;

providing a ratio of the sum of the surface areas of the core particles contained in the aqueous suspension to the volume of the aqueous suspension between 0.1 to 15 m²/l;

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adding a nickel ion-containing solution containing the same complexing agent and a reducing agent-containing solution individually and simultaneously to the aqueous suspension containing the core particles provided with the initial thin nickel films and the complexing agent to perform electroless plating;

adjusting the amounts of the nickel ion-containing solution added and the reducing agent-containing solution added;

adjusting the initial concentration of the complexing agent in the aqueous suspension;

adjusting the concentration of the complexing agent in the nickel ion-containing solution, so as to maintain the concentration of the complexing agent in the aqueous suspension in the range of 0.003 to 10 moles/l in said step of adding a nickel ion-containing solution containing the same complexing agent and a reducing agent-containing solution; and

forming a gold plating layer as a top layer on the nickel film.